(ADD)

Antenna pattern formulae for Figure 7*bis*

Co-polar pattern

$G_{co}(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda}\varphi\right)^2$ for $0 \leq \varphi < \varphi_m$ where $\varphi_m = \frac{\lambda}{D}\sqrt{\frac{G_{max} - G_1}{0.0025}}$

$G_{co}(\varphi) = G_1 = 29 - 25 \log \varphi_r$ for $\varphi_m \leq \varphi < \varphi_r$ where $\varphi_r = 95 \frac{\lambda}{D}$

$G_{co}(\varphi) = 29 - 25 \log \varphi$ for $\varphi_r \leq \varphi < \varphi_b$ where $\varphi_b = 10^{(34/25)}$

$G_{co}(\varphi) = -5$ dBi for $\varphi_b \leq \varphi < 70°$

$G_{co}(\varphi) = 0$ dBi for $70° \leq \varphi < 180°$

Cross-polar pattern

$G_{cross}(\varphi) = G_{max} - 25$ for $0 \leq \varphi < 0.25\,\varphi_0$

where $\varphi_0 = 2\frac{\lambda}{D}\sqrt{\frac{3}{0.0025}}$ = 3 dB beamwidth

$G_{cross}(\varphi) = G_{max} - 25 + 8\left(\frac{\varphi - 0.25\,\varphi_0}{0.19\,\varphi_0}\right)$ for $0.25\,\varphi_0 \leq \varphi < 0.44\,\varphi_0$

$G_{cross}(\varphi) = G_{max} - 17$ for $0.44\,\varphi_0 \leq \varphi < \varphi_0$

$G_{cross}(\varphi) = G_{max} - 17 - 13.5625\left|\frac{\varphi - \varphi_0}{\varphi_1 - \varphi_0}\right|$ for $\varphi_0 \leq \varphi < \varphi_1$ where $\varphi_1 = \frac{\varphi_0}{2}\sqrt{10.1875}$

$G_{cross}(\varphi) = 21 - 25 \log \varphi$ for $\varphi_1 \leq \varphi < \varphi_2$ where $\varphi_2 = 10^{(26/25)}$

$G_{cross}(\varphi) = -5$ dBi for $\varphi_2 \leq \varphi < 70°$

$G_{cross}(\varphi) = 0$ dBi for $70° \leq \varphi < 180°$

For the 60 cm antenna pattern which is to be used as a reference for replanning, the following parameters apply:

Co-polar

$G_{max} = 35.5$ dBi

$D/\lambda = 23.4$

$\varphi_m = 3.66°$

$\varphi_r = 4.04°$

$G_1 = 13.84$ dBi

$\varphi_b = 10^{(34/25)}$

Cross-polar

$\varphi_0 = 2.96°$

$\varphi_1 = 4.73°$

$\varphi_2 = 10.96°$

NOC

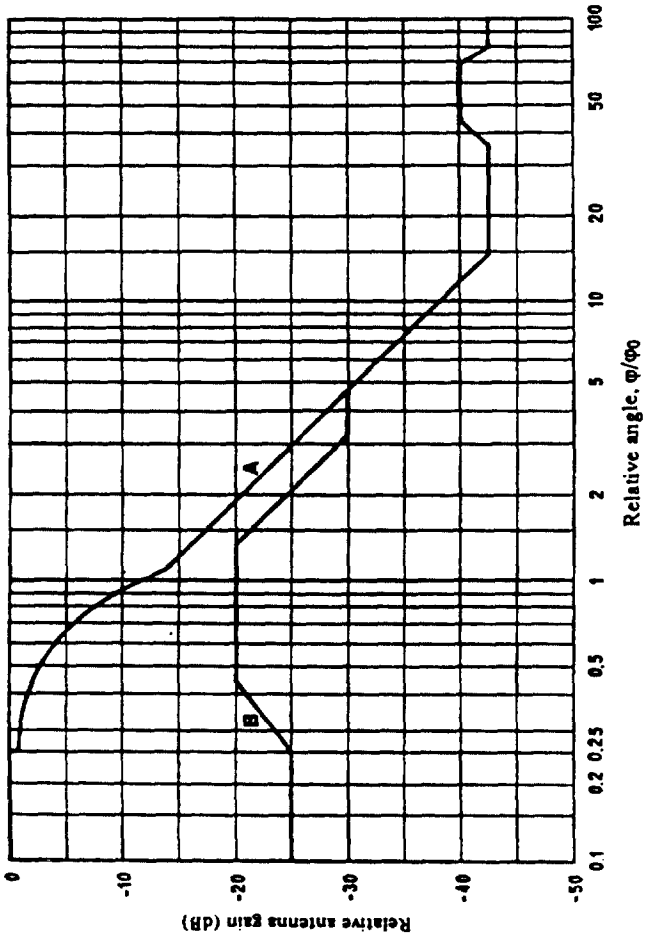


FIGURE 8

Reference patterns for co-polar and cross-polar components for receiving earth station antennas in Region 2

(MOD)

Antenna pattern formulae for Figure 8

Curve A: Co-polar component without side-lobe suppression (dB relative to main beam gain)

0	for $0 \le \varphi \le 0.25\ \varphi_0$
$-12\ (\varphi/\varphi_0)^2$	for $0.25\ \varphi_0 < \varphi \le 1.13\ \varphi_0$
$-\{14 + 25 \log (\varphi/\varphi_0)\}$	for $1.13\ \varphi_0 < \varphi \le 14.7\ \varphi_0$
-43.2	for $14.7\ \varphi_0 < \varphi \le 35\ \varphi_0$
$-\{85.2 - 27.2 \log (\varphi/\varphi_0)\}$	for $35\ \varphi_0 < \varphi \le 45.1\ \varphi_0$
-40.2	for $45.1\ \varphi_0 < \varphi \le 70\ \varphi_0$
$-\{-55.2 + 51.7 \log (\varphi/\varphi_0)\}$	for $70\ \varphi_0 < \varphi \le 80\ \varphi_0$
-43.2	for $80\ \varphi_0 < \varphi \le 180°$

Curve B: Cross-polar component (dB relative to main beam gain)

-25	for $0 \le \varphi \le 0.25\ \varphi_0$
$-\left(30 + 40 \log \lvert \frac{\varphi}{\varphi_0} - 1 \rvert\right)$	for $0.25\ \varphi_0 < \varphi \le 0.44\ \varphi_0$
-20	for $0.44\ \varphi_0 < \varphi \le 1.28\ \varphi_0$
$-\left(17.3 + 25 \log \lvert \frac{\varphi}{\varphi_0} \rvert\right)$	for $1.28\ \varphi_0 < \varphi \le 3.22\ \varphi_0$

-30 until intersection with co-polar component curve; then co-polar component curve.

NOTE 1 - For values of φ_0 see paragraph 3.7.1.

NOTE 2 - In the angular range between $0.1\ \varphi_0$ and $1.13\ \varphi_0$ the co-polar and cross-polar gains must not exceed the reference patterns.

NOTE 3 - At off-axis angles larger than $1.13\ \varphi_0$ and for 90% of all sidelobe peaks in each of the reference angular windows, the gain must not exceed the reference patterns. The reference angular windows are $1.13\ \varphi_0$ to $3\ \varphi_0$, $3\ \varphi_0$ to $6\ \varphi_0$, $6\ \varphi_0$ to $10\ \varphi_0$, $10\ \varphi_0$ to $20\ \varphi_0$, $20\ \varphi_0$ to $40\ \varphi_0$, $40\ \varphi_0$ to $75\ \varphi_0$ and $75\ \varphi_0$ to 180°.

(MOD)

3.8 Necessary bandwidth

The necessary bandwidths considered are as follows for:

- 625-line systems in Regions 1 and 3: 27 MHz;
- 525-line systems in Region 3: 27 MHz.

However, in Regions 1 and 3, if different bandwidths are submitted, they will be treated in accordance with applicable ITU-R Recommendations for protection masks when available. In the absence of such Recommendations, the Bureau will use the worst-case approach as adopted by the Radio Regulations Board.

In Region 2, the Plan is based on a channel bandwidth of 24 MHz[1], but different bandwidths may be implemented in accordance with the provisions of this Appendix, provided that applicable ITU-R Recommendations are available. In the absence of such Recommendations, the Bureau will use the worst-case approach as adopted by the Radio Regulations Board.

NOC

3.9 Guardbands

NOC

3.9.1 A guardband is defined as the portion of the frequency spectrum between the edge of the allocated band and the edge of the necessary bandwidth of the emission in the nearest channel.

(MOD)

3.9.2 For the planning of the broadcasting-satellite service, the guardbands chosen at WARC-77 to protect the services in adjacent frequency bands are shown in the table below.

Regions	Guardband at the lower edge of the band	Guardband at the upper edge of the band
1	14 MHz	11 MHz
2	12 MHz	12 MHz
3	14 MHz	11 MHz

For Regions 1 and 3, for analogue emissions the guardbands assume a maximum beam centre e.i.r.p. of 67 dBW (value relating to individual reception), and a filter roll-off of 2 dB/MHz. If smaller e.i.r.p. values are assumed, the guardbands can be reduced in width by 0.5 MHz for each decibel decrease in e.i.r.p. The degree of possible reduction also depends on improvements in technology and on the type of modulation. However, an appropriate ITU-R Recommendation concerning the sharing requirements is not yet available.

(SUP)

(MOD)

3.9.3 The guardbands at both the lower and upper edges may be used for transmissions in the space operation service.

---

[1] For France, Denmark and some of the United Kingdom requirements which use 625-line standards with greater video bandwidth, the channels shown in the Plan have a necessary bandwidth of 27 MHz. This is indicated by an appropriate symbol in the Plan.

NOC

3.10 Orbital spacing

The Plan for Regions 1 and 3 has been based generally on nominal orbital positions spaced uniformly at intervals of 6°. The Plan for Region 2 has been based on a non-uniform spacing.

(MOD)

3.11 Satellite station-keeping

Space stations in the broadcasting-satellite service must be maintained in position with an accuracy equal to or better than ±0.1° in the E-W directions. For such space stations, the maintenance of the tolerance ±0.1° in the N-S direction is recommended but is not a requirement.

(MOD)

3.12 Elevation angle of receiving antennas

The Plans have been based on the desirability of a minimum angle of elevation of 20° to minimize the required e.i.r.p. of the satellite and to reduce the effects of shadowing and the possibility of interference from terrestrial services. However, for areas situated in latitudes above about 60°, the angle of elevation is of necessity less than 20°. Attention is also drawn to Section 2.2 for the Regions 1 and 3 Plan and to Section 2.4.3 for the Region 2 Plan.

For mountainous areas where an elevation angle of 20° may not suffice, an angle of at least 30° has been provided, where possible, to provide an acceptable service. An angle of elevation of at least 40° has been considered for service areas subject to high precipitation, but exceptions were made in some cases in Region 2.

Some dry, non-mountainous areas may be given an acceptable service at angles of elevation less than 20°.

In areas with small elevation angles, the shadowing effect of tall buildings may have to be taken into account.

In choosing a satellite position designed to give the maximum angle of elevation at the ground, the influence of such a position on the eclipse period was taken into account at WARC-77. In the revision of the Regions 1 and 3 Plan at WRC-97, this influence was not considered to be a significant constraint on the choice of orbital position.

NOC

3.13 Transmitting antennas

(MOD)

3.13.1 Cross-section of transmitted beam

Planning in Regions 1, 2 and 3 has been generally based on the use of satellite transmitting antennas with beams of elliptical cross-section.

If the cross-section of the emitted beam is elliptical, the effective beamwidth φ_0 is a function of the angle of rotation between the plane containing the satellite and the major axis of the beam cross-section and the plane in which the beamwidth is required.

The relationship between the maximum gain of an antenna and the half-power beamwidth can be derived from the expression:

$$G_m = \frac{27\,843}{ab}$$

where:

a and b are the angles (in degrees) subtended at the satellite by the major and minor axes of the elliptical cross-section of the beam; an antenna efficiency of 55% was assumed.

However, in implementing their assignments, administrations can choose beams other than elliptical, as described in Annex 2 to this Appendix, subject to successful application of the modification procedure of this Appendix.

NOC

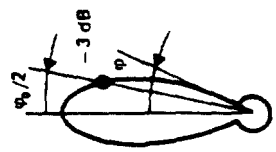
3.13.2 Minimum beamwidth of transmitting antenna

A minimum value of 0.6° for the half-power beamwidth of a transmitting antenna has been adopted for planning for Regions 1 and 3, and 0.8° for Region 2.

NOC

3.13.3 Transmitting antenna reference patterns

The reference patterns for the co-polar and cross-polar components of satellite transmitting antennas used in preparing the Plans are given in Figure 9 for Regions 1 and 3, and in Figure 10 for Region 2.



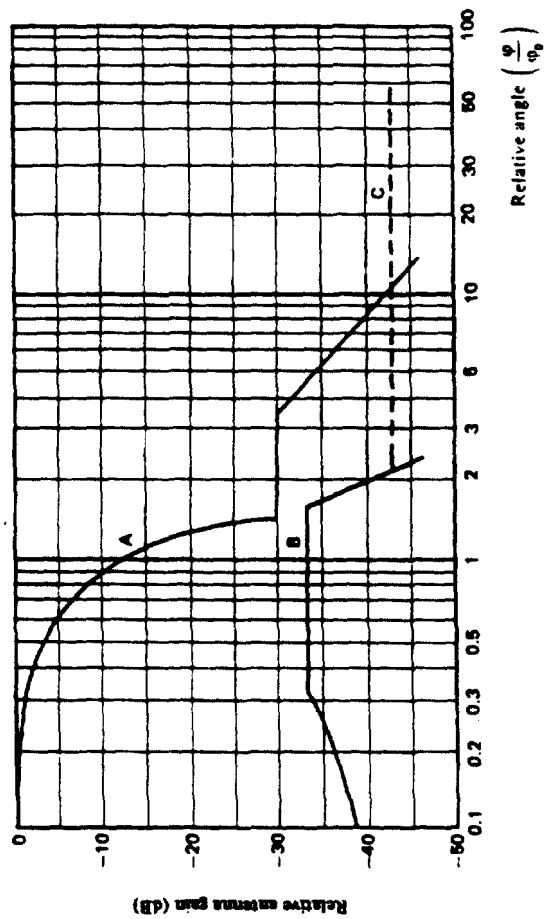


FIGURE 9

Reference patterns for co-polar and cross-polar components for satellite transmitting antennas in Regions 1 and 3

NOC

Curve A: Co-polar component (dB relative to main beam gain)

$-12\left(\frac{\varphi}{\varphi_0}\right)^2$ for $0 \le \varphi \le 1.58\ \varphi_0$

-30 for $1.58\ \varphi_0 < \varphi \le 3.16\ \varphi_0$

$-\left[17.5 + 25 \log\left(\frac{\varphi}{\varphi_0}\right)\right]$ for $\varphi > 3.16\ \varphi_0$

after intersection with Curve C: as Curve C

Curve B: Cross-polar component (dB relative to main beam gain)

$-\left(40 + 40 \log \left| \frac{\varphi}{\varphi_0} - 1 \right| \right)$ for $0 \le \varphi \le 0.33\ \varphi_0$

-33 for $0.33\ \varphi_0 < \varphi \le 1.67\ \varphi_0$

$-\left(40 + 40 \log \left| \frac{\varphi}{\varphi_0} - 1 \right| \right)$ for $\varphi > 1.67\ \varphi_0$

after intersection with Curve C: as Curve C

Curve C: Minus the on-axis gain (Curve C in this figure illustrates the particular case of an antenna with an on-axis gain of 43 dBi).

NOC

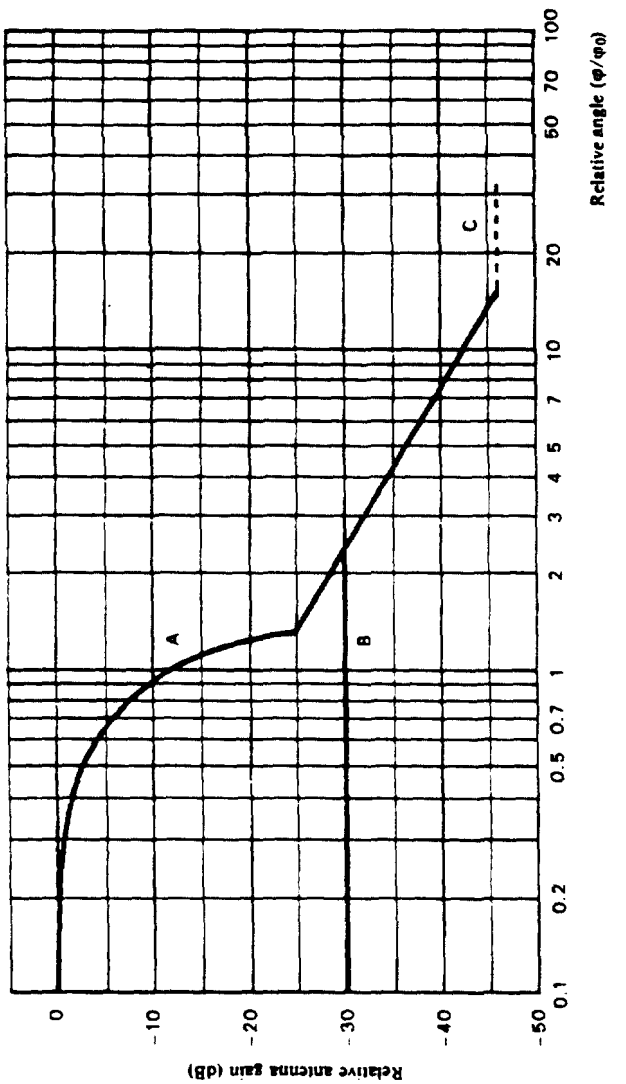


FIGURE 10

Reference patterns for co-polar and cross-polar components for satellite transmitting antennas in Region 2

(MOD)

Curve A: Co-polar component (dB relative to main beam gain)

$-12\ (\varphi/\varphi_0)^2$ for $0 \leq (\varphi/\varphi_0) \leq 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with curve C: Curve C

Curve B: Cross-polar component (dB relative to main beam gain)

-30 for $0 \leq (\varphi/\varphi_0) \leq 2.51$

after intersection with co-polar pattern: co-polar pattern

Curve C: Minus the on-axis gain (Curve C in this figure illustrates the particular case of an antenna with an on-axis gain of 46 dBi).

In Region 2, when it was necessary to reduce interference, the pattern shown in Figure 11a was used; this use is indicated in the Plan by an appropriate symbol. This pattern is derived from an antenna producing an elliptical beam with fast roll-off in the main lobe assuming a "beamlet" half-power beamwidth of 0.8°. For Regions 1 and 3, the pattern shown in Figure 11b, based on a "beamlet" beamwidth of 0.6° was used. Curves for three different values of φ_0 are shown as examples in Figure 11a and in Figure 11b.

(MOD)

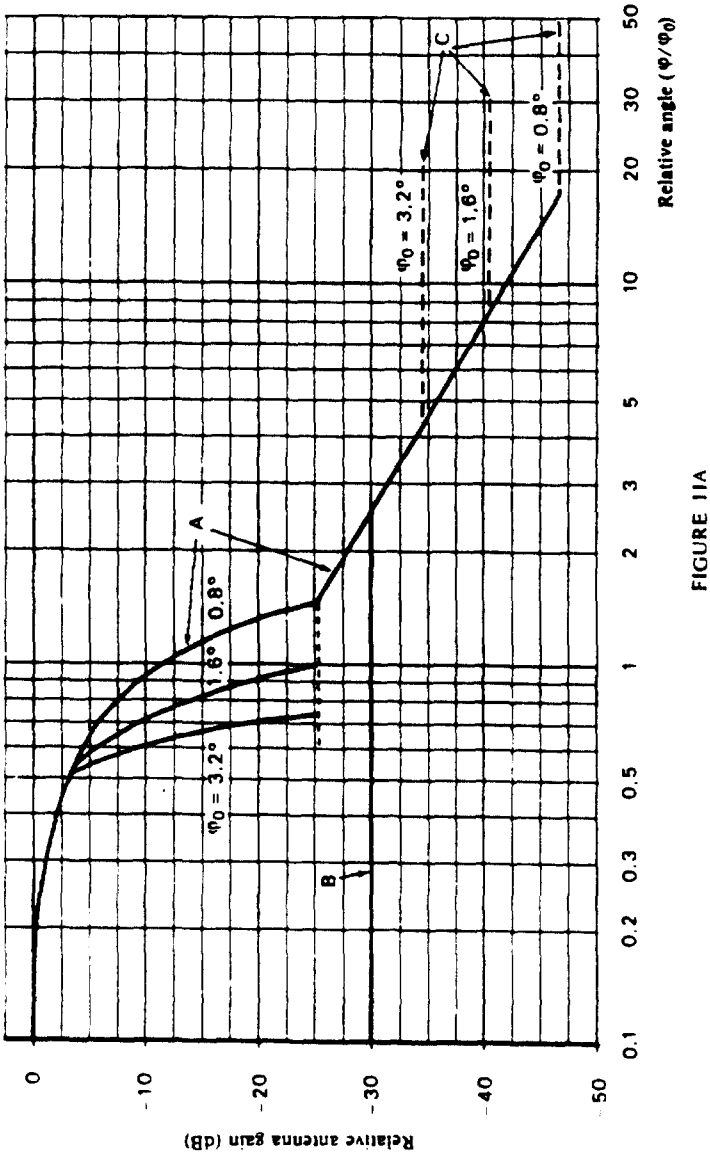


FIGURE 11A

Reference patterns for co-polar and cross-polar components for satellite transmitting antennas with fast roll-off in the main beam for Region 2

(MOD)

Curve A: Co-polar component (dB relative to main beam gain)

$-12\,(\varphi/\varphi_0)^2$ for $0 \le (\varphi/\varphi_0) \le 0.5$

$$-12\left(\frac{\frac{\varphi}{\varphi_0}-x}{\frac{B_{min}}{\varphi_0}}\right)^2 \quad \text{for } 0.5 < (\varphi/\varphi_0) \le \left(\frac{1.45}{\varphi_0}B_{min}+x\right)$$

-25.23 for $\left(\frac{1.45}{\varphi_0} B_{min} + x\right) < (\varphi/\varphi_0) \leq 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with curve C: Curve C

Curve B: Cross-polar component (dB relative to main beam gain)

-30 for $0 \leq (\varphi/\varphi_0) < 2.51$

after intersection with co-polar pattern: co-polar pattern

Curve C: Minus the on-axis gain (Curves A and C represent examples of three antennas having different values of φ_0 as labelled in Figure 11. The on-axis gains of these antennas are approximately 34, 40 and 46 dBi, respectively).

where:

φ = off-axis angle (degrees)

φ_0 = dimension of the minimum ellipse fitted around the down-link service area in the direction of interest (degrees)

$B_{min} = 0.8°$ for Region 2 and $B_{min} = 0.6°$ for Regions 1 and 3

$x = 0.5\left(1 - \frac{0.8}{\varphi_0}\right)$ in Region 2

$x = 0.5\left(1 - \frac{0.6}{\varphi_0}\right)$ in Regions 1 and 3

(ADD)

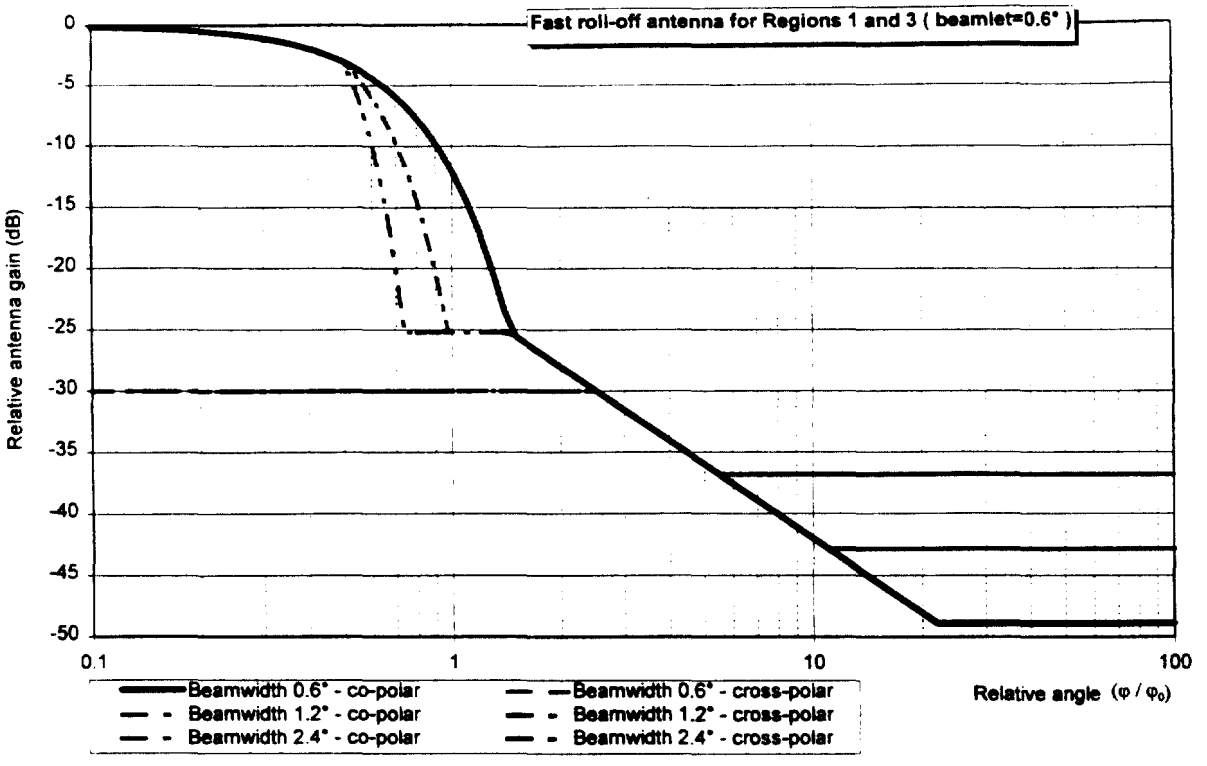


FIGURE 11b

Fast roll-off antenna for Region 1 and 3 Plan revision (beamlet beamwidth of 0.6 deg.)

(ADD)

The difference in performance between the fast roll-off satellite transmitting antenna and the reference satellite transmitting antenna for Regions 1 and 3 is shown in Figure 12.

(ADD)

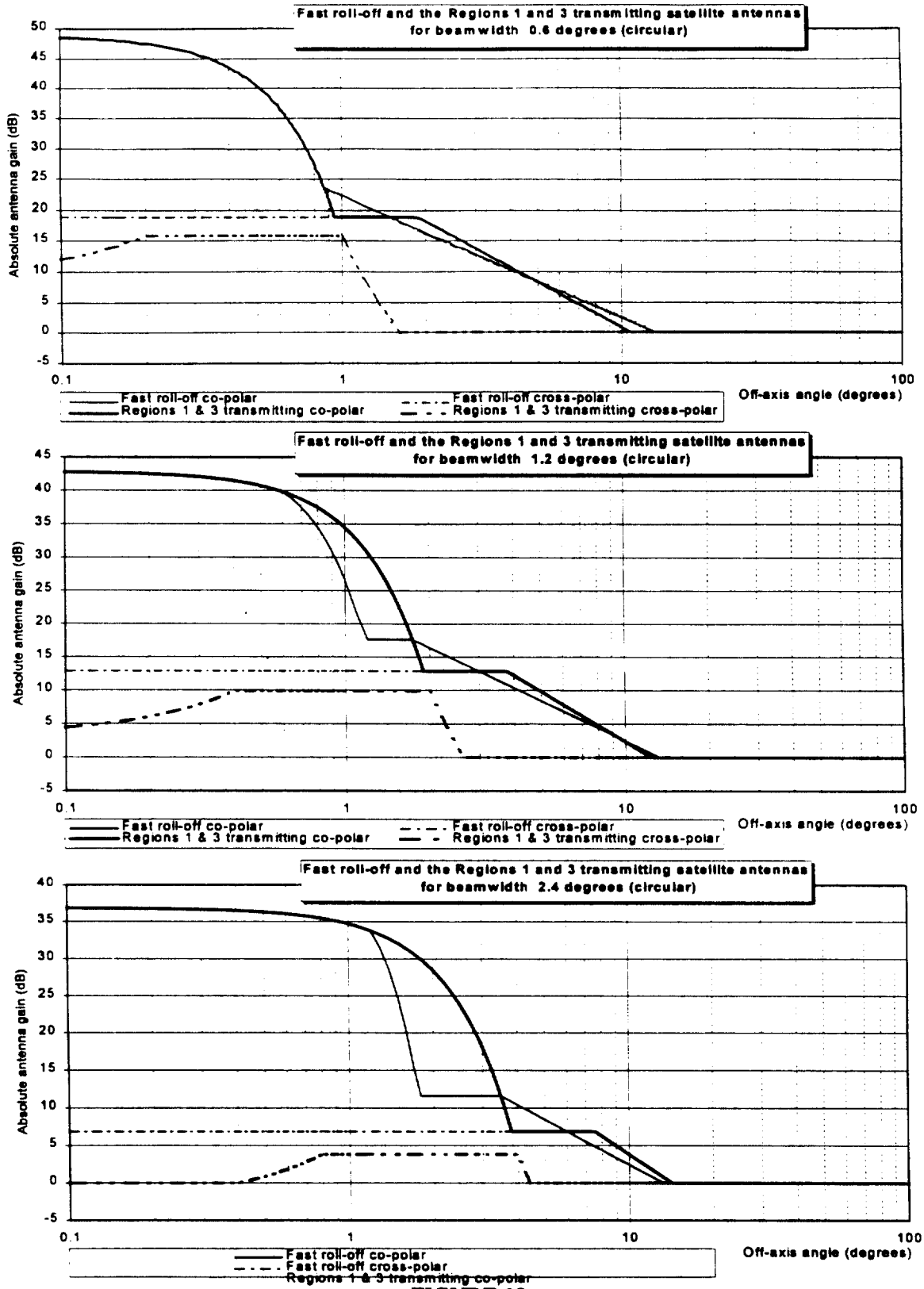


FIGURE 12

Comparison between fast roll-off and Regions 1 and 3 reference satellite transmitting antennas

(MOD)

3.14 Satellite antenna pointing accuracy

3.14.1 The deviation of the antenna beam from its nominal pointing direction must not exceed a limit of 0.1° in any direction. Moreover, the angular rotation of a transmitting beam about its axis must not exceed a limit of ±1°; the limit on rotation is not necessary for beams of circular cross-section using circular polarization[1].

3.14.2 The following factors contribute to the total variation in the area on the surface of the Earth illuminated by the satellite beam:

- variations in satellite station-keeping;
- the variations caused by the pointing tolerances, which become more significant for coverage areas with low angles of elevation;
- the effect of the yaw error, which increases as the beam ellipse lengthens.

3.14.3 The effect of these possible variations should be assessed on a case-by-case basis, since their total effect on the area covered will vary with the geometry of the satellite beam, and it would not be reasonable to indicate a single value of shift in the area covered for all situations.

3.14.4 If linear polarization is used for an emission, yaw error makes a significant contribution to increasing the transmitted cross-polarized component; this increases the interference with other carriers which were originally cross-polarized with the emission in question.

NOC

3.15 Limitation of output power in the satellite transmitter

The output power of a space station transmitter in the broadcasting-satellite service must not rise by more than 0.25 dB relative to its nominal value throughout the life of the satellite.

---

[1] In the original WARC-77 BSS Plan for Regions 1 and 3, the angular rotation of a transmitting beam about its axis must not exceed a limit of ±2° This limit is still applied for the assignments notified, which are in conformity with this Appendix, brought into use, and for which the date of bringing into use has been confirmed to the Bureau before 27 October 1997.

(MOD)

3.16 Power flux-density at edge of coverage area

The original 1977 BSS Plan used the following values[1] of the power flux-density at the edge of the coverage area exceeded for 99% of the worst month:

– 103 dB(W/m^2) for individual reception in Regions 1 and 3;

– 107 dB(W/m^2) for individual reception in Region 2 for 24 MHz, as well as for 27 MHz with respect to the cases mentioned in the footnote to Section 3.8.

– 111 dB(W/m^2) for community reception in Regions 1 and 3.

The 1997 revision of the Regions 1 and 3 Plan was generally based on a uniform value of the power flux-density at the edge of coverage area equal to -108 dB(W/m^2). This corresponds to the general reduction in e.i.r.p. of 5 dB referenced to the average e.i.r.p. of 63.9 dBW in the WARC-77 Plan.

NOC

3.17 Difference between the e.i.r.p. directed towards the edge of the coverage area and that on the axis of the beam

For planning, the absolute value of the difference between the e.i.r.p. directed towards the edge of the coverage area and that on the axis of the beam should preferably be 3 dB.

If the beam area is larger than the coverage area, the value will be less than 3 dB.

(MOD)

3.18 Use of energy dispersal

For planning, an energy dispersal value has been adopted which reduces by 22 dB the spectral power flux-density measured in a 4 kHz bandwidth in relation to that measured in the entire bandwidth: For frequency modulated television signals, this reduction corresponds to a peak-to-peak deviation of 600 kHz. Digital modulation can achieve appropriate energy dispersal by proper implementation of digital modulation (e.g. by applying spectrum scrambling and/or interleaving).

---

[1] These values are still used for the assignments notified, which are in conformity with this Appendix, brought into use, and for which the date of bringing into use has been confirmed to the Bureau before 27 October 1997.

ANNEX 6[1]

Criteria for Sharing Between Services

1. Protection requirements for sharing between services in the 12 GHz band

...

(MOD) 1.5 The specified values of protection ratio (i.e., the carrier-to-interference power ratio corresponding to a specified picture quality) are applicable, for planning purposes, to television signals of any of the several television standards.

[1] Sections 1 and 2 of this Annex are applicable when the services of Regions 1 or 3 are involved. Section 3 is applicable to all Regions.

APPENDIX S30A (WRC-97)

Provisions and Associated Plans for Feeder Links for the Broadcasting-Satellite Service (11.7 - 12.5 GHz in Region 1, 12.2 - 12.7 GHz in Region 2 and 11.7 - 12.2 GHz in Region 3) in the Frequency Bands 14.5 - 14.8 GHz[1] and 17.3 - 18.1 GHz in Regions 1 and 3, and 17.3 - 17.8 GHz in Region 2

...

ARTICLE 3

Execution of the Provisions and Associated Plans

(MOD) 3.1 The Member States of the Union in Regions 1, 2 and 3 shall adopt for their feeder-link space and earth stations in the fixed-satellite service (Earth-to-space) in the frequency bands referred to in this Appendix the characteristics specified in the appropriate Regional Plan and the associated provisions.

(MOD) 3.2 Member States of the Union shall not change the characteristics specified in the Region 1 and Region 3 Plans or in the Region 2 Plan, or bring into use assignments to receiving space stations or transmitting earth stations in the fixed-satellite service or to stations of the other services to which these frequency bands are allocated, except as provided for in the Radio Regulations and the appropriate Articles and Annexes of this Appendix.

...

[1] This use of the band 14.5 - 14.8 GHz is reserved for countries outside Europe.

ARTICLE 4

Procedure for Modifications to the Plans

4.1 When an administration intends to make a modification to one of the Regional Plans, i.e. either:

a) to modify the characteristics of any of its frequency assignments in the fixed-satellite service which are shown in the appropriate Regional Plan, or for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use; *or*

b) to include in the Plan a new frequency assignment in the fixed-satellite service; *or*

c) to cancel a frequency assignment in the fixed-satellite service,

(MOD) the following procedure shall be applied before any notification of the frequency assignment is made to the Radiocommunication Bureau (see Article 5 of this Appendix and Resolution **42 (Rev.Orb-88)**).

4.1.1 Before an administration proposes to include in the Plan, under the provisions of § 4.1 *b)*, a new frequency assignment to a space station or to include in the Plan new frequency assignments to a space station whose orbital position is not designated in the Plan for this administration, all the assignments to the service area involved should have been brought into service or have been notified to the Bureau in accordance with the relevant provisions of the Plan.

...

(MOD) 4.2.1.2 having a frequency assignment in the band 17.7 - 18.1 GHz to an earth station in the fixed-satellite service (space-to-Earth), which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. **S9.7** of the Radio Regulations and which is located within the coordination area of the feeder-link fixed-satellite earth station; *or*

4.2.1.3 having a frequency assignment in the bands 14.5 - 14.8 GHz or 17.7 - 18.1 GHz to a terrestrial station in use or intended to be brought into use within three years of the projected date of bringing the feeder-link modification into use, and which is located within the coordination area of the feeder-link fixed-satellite earth station; *or*

...

(MOD) 4.2.3.2 having a frequency assignment in the band 17.7 - 17.8 GHz to an earth station in the fixed-satellite service (space-to-Earth), which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. **S9.7** of the Radio Regulations and which is located within the coordination area of the feeder-link fixed-satellite earth station; *or*

...

ARTICLE 5

Coordination, Notification, Examination and Recording in the Master International Frequency Register of Frequency Assignments to Feeder-Link Transmitting Earth Stations and Receiving Space Stations in the Fixed-Satellite Service

...

MOD 5.1.5 If an administration with which coordination is sought under paragraph 5.1.4 does not respond within three months, the administration intending to bring into use a frequency assignment to a feeder-link earth station shall notify this frequency assignment in accordance with paragraph 5.1.2 above.

...

5.2 Examination and recording

5.2.1 The Bureau shall examine each notice:

a) with respect to its conformity with the Convention and the relevant provisions of the Radio Regulations (with the exception of those relating to *b)*, *c)*, *d)* and *e)* below); *and*

b) with respect to its conformity with the appropriate Regional Plan; *or*

c) with respect to its conformity with the appropriate Regional Plan, however, having characteristics differing from those in the Plan in one or more of the following aspects:

– use of a reduced e.i.r.p.,

– use of a reduced coverage area entirely situated within the coverage area appearing in the Plan,

MOD – use of other modulating signals in accordance with the provisions of Section 3.1.3 to Annex 5 of Appendix **S30 (WRC-97)**,

MOD – in the case of Region 2, use of an orbital position under the conditions specified in paragraph B of Annex 7 to Appendix **S30 (WRC-97)**,

MOD – in the case of Regions 1 and 3, use of an orbital position under the conditions specified in Section 3.15 of Annex 3 to Appendix **S30A (WRC-97)**[1],

...

[1] The Bureau shall also apply this provision to paragraph 5.2.1 *c)* of Appendix **S30 (WRC-97)** for Regions 1 and 3.

ARTICLE 10

Interference

MOD 10.1 The Member States of the Union shall endeavour to agree on the action required to reduce harmful interference which might be caused by the application of these provisions and the associated Plans.

...

ANNEX 2

(to Appendix 30A (S30A))

Basic Characteristics to be Furnished in Notices[1] Relating to Feeder-Link Stations in the Fixed-Satellite Service Operating in the Frequency Bands 14.5 - 14.8 GHz and 17.3 - 18.1 GHz[2]

(NOC) 1. The following information shall be provided in notices relating to both transmitting earth stations and receiving space stations.

(NOC) 1.1 Country and beam identification.

(NOC) 1.2 Assigned frequency.

(NOC) 1.3 Assigned frequency band.

(NOC) 1.4 Date of bringing into use.

(NOC) 1.5 Designation of emission (in accordance with Article **S2** of the Radio Regulations).

(NOC) 1.6 Modulation characteristics:

(NOC) *a)* type of modulation;

(NOC) *b)* pre-emphasis characteristics;

(NOC) *c)* TV system;

(NOC) *d)* sound-broadcasting characteristics;

(NOC) *e)* frequency deviation;

(NOC) *f)* composition of the baseband;

(NOC) *g)* type of multiplexing of the video and sound signals;

(NOC) *h)* energy dispersal characteristics;

(ADD) *i)* in the case of a digital modulation, the effective and transmitted bit/symbol rates.

(NOC) 2. The following additional information shall be provided in notices relating to transmitting earth stations.

(NOC) 2.1 Identity of the transmitting feeder-link station.

(NOC) [1] The Bureau shall develop and keep up to date forms of notice to meet fully the statutory provisions of this Annex. The Bureau is further invited to consider the feasibility of a single notice for feeder-link earth stations operating within more than one feeder-link service area.

(NOC) [2] Only those notices relating to frequency assignments for space stations and earth stations used for telecommand and tracking purposes associated with the Plan shall be furnished in accordance with Appendix **S4**.

(MOD) 2.2 For a specific feeder-link earth station, identity of the earth station and the geographical coordinates of the antenna site.

(MOD) 2.3 Feeder-link service area identified by:

(MOD) *a)* a set of a maximum of twenty feeder-link test points, and

(ADD) *b)* a service-area contour on the surface of the Earth or a service area defined by a minimum elevation angle in degrees.

(NOC) 2.4 Identity of the associated space station with which communication is to be established.

(NOC) 2.5 Power characteristics of the transmission:

(NOC) *a)* The following information is required for each assigned frequency:

(NOC) – total transmitting power (dBW) in the assigned frequency band supplied to the input of the antenna;

(NOC) – for the band 17.3 - 18.1 GHz, the maximum power density per Hz (dB(W/Hz)) supplied to the input of the antenna averaged over the worst 1 MHz band;

(NOC) – for the band 14.5 - 14.8 GHz, the maximum power density per Hz (dB(W/Hz)) supplied to the input of the antenna averaged over the worst 4 kHz band;

(NOC) – for the band 17.3 - 17.8 GHz, the maximum power density per Hz (dB(W/Hz)) supplied to the input of the antenna averaged over the total RF bandwidth (24 MHz for Region 2 or 27 MHz for Regions 1 and 3).

(MOD) *b)* Additional information required if power control is used (see Sections [3.11] and [4.10] of Annex 3 to this Appendix):

(NOC) – range, expressed in dB, above the transmitting power used in *a)* above.

(MOD) 2.6 Earth station transmitting antenna characteristics:

(NOC) *a)* antenna diameter (metres);

(NOC) *b)* gain of the antenna in the direction of maximum radiation referred to an isotropic radiator (dBi);

(NOC) *c)* half-power beamwidth in degrees (describe in detail if not symmetrical);

(NOC) *d)* measured radiation diagram of the antenna (taking as a reference the direction of maximum radiation), or reference radiation diagram to be used for coordination;

(NOC) *e)* type of polarization;

(MOD) *f)* sense of polarization, and, in the case of a linear polarization, the angle (in degrees) measured counter-clockwise in a plane normal to the beam axis from the equatorial plane to the electric vector of the wave as seen from the satellite in the direction of the nominal boresight or aim point as defined under items 3.4 *e)* or 3.4 *f)* below;

(NOC) *g)* horizon elevation angle in degrees and the antenna gain in the direction of the horizon for each azimuth[1] around the earth station;

(NOC) *h)* altitude of the antenna above mean sea level, in metres;

(NOC) *i)* minimum elevation angle, in degrees.

(NOC) 2.7 Regular hours of operation (UTC).

(NOC) 2.8 Coordination.

(NOC) 2.9 Agreements.

(NOC) 2.10 Other information.

(MOD) 2.11 Operating administration or agency.

(NOC) 3. The following information shall be provided in notices relating to receiving space stations.

(NOC) 3.1 Orbital position (from the Greenwich Meridian).

(NOC) 3.2 Identity of the space station.

(NOC) 3.3 Class of station.

(NOC) 3.4 Space station receiving antenna characteristics:

(MOD) *a)* co-polar gain of the antenna in the direction of maximum radiation referred to an isotropic radiator (dBi), as well as the cross-polar gain of the antenna in the case of a beam of other than elliptical shape;

(NOC) *b)* pointing accuracy (degrees);

(NOC) *c)* type of polarization;

(MOD) *d)* sense of polarization, and, in the case of a linear polarization, the angle (in degrees) measured counter-clockwise in a plane normal to the beam axis from the equatorial plane to the electric vector of the wave as seen from the satellite in the direction of the nominal boresight or aim point as defined under items 3.4 *e)* or 3.4 *f)* below;

(MOD) *e)* for elliptical beams[2], indicate the following:

(NOC) – co-polar and cross-polar radiation patterns;

(NOC) [1] At suitable increments, e.g. every five degrees, in tabular or graphic form.

(ADD) [2] A circular beam is considered as a particular elliptical beam where major and minor axes are equal and where major axis orientation and rotational accuracy are equal to 0°.

(NOC) – rotation accuracy (degrees);

(NOC) – orientation (degrees);

(NOC) – major axis (degrees) at the half-power beamwidth;

(NOC) – minor axis (degrees) at the half-power beamwidth;

(NOC) – nominal intersection of the antenna beam axis with the Earth (boresight longitude and latitude);

(MOD) *f)* for beams of other than elliptical shape, indicate the following:

(NOC) – co-polar and cross-polar gain contours plotted on a map of the Earth's surface, preferably in a radial projection from the satellite onto a plane perpendicular to the axis from the centre of the Earth to the satellite. The isotropic gain shall be indicated at each contour which corresponds to a decrease in gain of 2, 4, 6, 10 and 20 dB and thereafter at 10 dB intervals down to a value of 0 dB relative to an isotropic radiator;

(NOC) – wherever practicable, a numerical equation or table providing the necessary information to allow the gain contours to be plotted;

(ADD) – nominal intersection of the antenna beam axis with the Earth (boresight or aim point, longitude and latitude);

(NOC) *g)* for an assignment in the bands 14.5 - 14.8 GHz or 17.7 - 18.1 GHz, the isotropic gain in the direction of those parts of the geostationary-satellite orbit which are not obstructed by the Earth. Use a diagram showing estimated isotropic gain relative to orbit longitude.

(NOC) 3.5 Receiver system noise temperature referred to the output of the antenna (kelvins).

(NOC) 3.6 Station-keeping accuracy (degrees).

(NOC) 3.7 Regular hours of operation (UTC).

(NOC) 3.8 Coordination.

(NOC) 3.9 Agreements.

(NOC) 3.10 Other information.

(NOC) 3.11 Operating administration or agency.

(NOC) 3.12 Range of automatic gain control[1].

(ADD) 4. Connection between Earth-to-space and space-to-Earth frequencies in the network in the case of Region 2.

(ADD) 5. Description of the group(s) required in the case of non-simultaneous emissions.

(MOD) [1] See Sections [3.10] and [4.9] of Annex [3] to this Appendix.